

Confined Spaces in Construction Subpart AA

29th Annual Construction
Industry Conference



Objectives

- Demarcation and Protection of Opening
- Space Evaluation
- Atmospheric Monitoring
- Equipment and PPE
- Ventilation




Signage & Protection of Opening

- If identify or receive notice of PRCS
- Must take effective measures to prevent unauthorized employees from entering



Space Evaluation

- [\\AACSBBS\RedirectedFolders\pdelucia\My Documents\SAFETY & COMPLIANCE\Training\Confined Space\Program\Confined Spaces 2015\2015\Confined Space Hazard Assessment \(07162015\).pdf](#)

 Confined Space Hazard Assessment

Project Name: _____ Assessment Date: _____
Project Address: _____ Competent Person: _____
Project Number: _____
Space Location: _____
Space Description: _____

Is the space a Confined Space?		Please Circle	
1. Is the space large enough and so configured that an employee can bodily enter it?	Yes	Yes	No
2. Does the space have a limited or restricted means of entry and exit?	Yes	Yes	No
3. Is the space NOT designed for continuous employee occupancy?	Yes	Yes	No

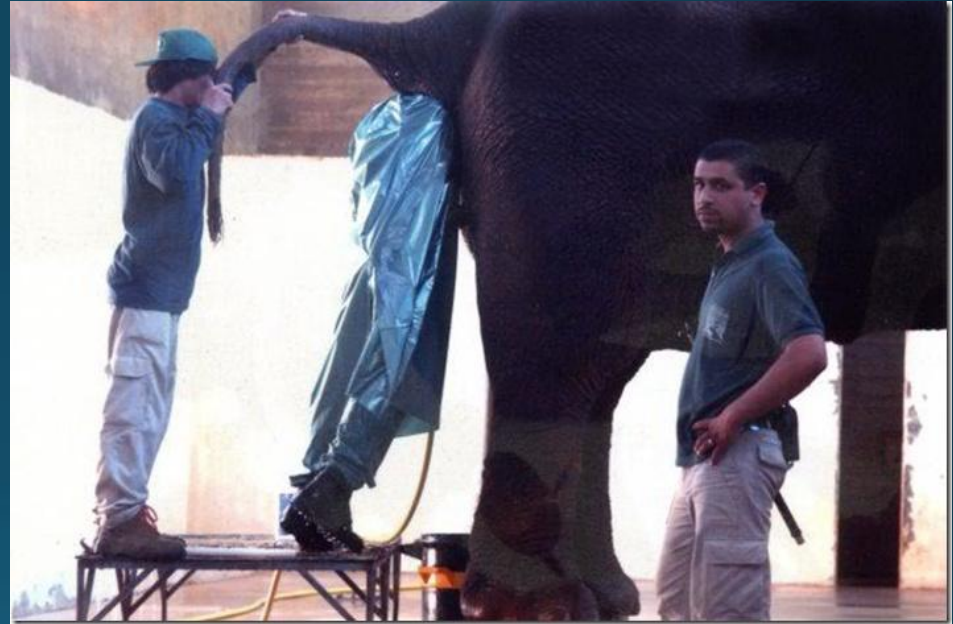
If the answer to all three questions above is Yes, the space is considered a Confined Space.
Is this space a confined space? Yes No
If NO, keep completed form on the jobsite and at the completion of the project file in job folder.
If YES, complete the questions below.

Is the space a Permit Required Confined Space?		Please Circle	
1. Does the space contain or does it have a potential to contain a hazardous atmosphere?			
<i>If yes, specify potential or known hazards</i>			
<input type="checkbox"/> Flammable gas/vapor/mist	<input type="checkbox"/> Oxygen, 19.5% or > 23.5%	Yes	No
<input type="checkbox"/> Combustible dust >= LFL	<input type="checkbox"/> Other IDLH atmospheric concentration		
<input type="checkbox"/> Obscure vision @ 5 Feet	<input type="checkbox"/> Atmospheric concentration exceeding the PEL		
<input type="checkbox"/> Other (i.e. inerting gas)	Specify: _____		
2. Does the space contain a material that has the potential for engulfing an entrant?			
Examples: Grain, sand, water			
Specify: _____			
3. Does the space have an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.			
Examples: Mixer, dust collector, etc.			
Specify: _____			
4. Contains any other recognized serious safety or health hazard			
Check all that apply			
<input type="checkbox"/> A. Mechanical Hazards	Specify known or potential hazards		
<input type="checkbox"/> B. Electrical hazards/energized equipment	_____		
<input type="checkbox"/> C. Gas or chemical hazards	_____		
<input type="checkbox"/> D. Elevations/Fall hazards	_____		
<input type="checkbox"/> E. Temperature extremes/heat stress	_____		
<input type="checkbox"/> F. Other	_____		
5. Will welding, cutting, torch work, or other hot work be performed?			
Yes No			

1

Space Evaluation

- Test prior to:
 - Changes in space's natural ventilation
 - Entry



Space Evaluation

- Testing
 - Oxygen
 - Combustible gases/vapors
 - Toxic gases/vapors
- Entrants (or auth. rep)
 - Observe testing
 - Request to Re-evaluate
 - Immediate access to results



Hazardous Atmosphere

- An atmosphere that may expose employees to the risk of:
 - Death
 - Incapacitation
 - Impairment of ability to self-rescue
 - Injury
 - Or acute illness



Note. An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this definition.

Airborne Exposure

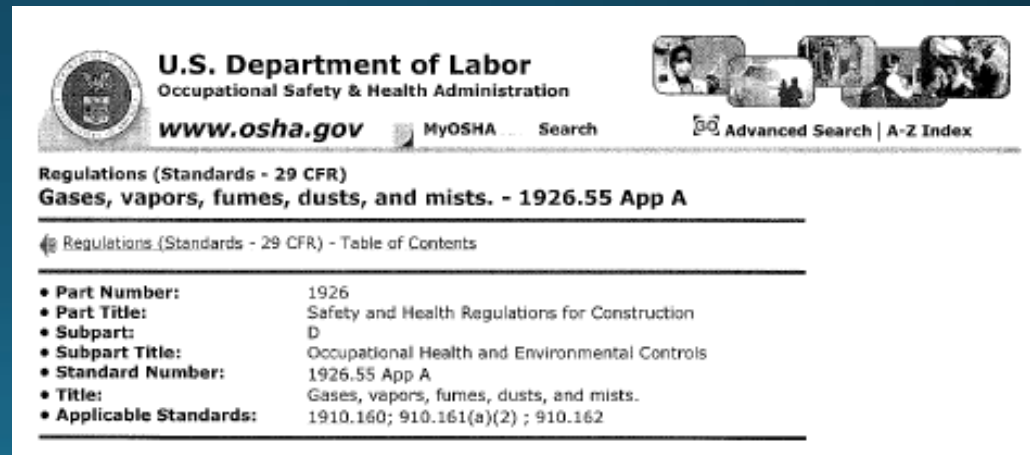
- PEL
 - OSHA
 - 8 hr TWA
- Ceiling
 - Concentration must never go above this level
- TLV
 - Exposure without an unreasonable risk of disease or injury
 - Scientific opinion
- STEL
 - Short term exposures

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS


DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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U.S. Department of Labor
Occupational Safety & Health Administration

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Regulations (Standards - 29 CFR)
Gases, vapors, fumes, dusts, and mists. - 1926.55 App A

[Regulations \(Standards - 29 CFR\) - Table of Contents](#)

• Part Number:	1926
• Part Title:	Safety and Health Regulations for Construction
• Subpart:	D
• Subpart Title:	Occupational Health and Environmental Controls
• Standard Number:	1926.55 App A
• Title:	Gases, vapors, fumes, dusts, and mists.
• Applicable Standards:	1910.160; 910.161(a)(2) ; 910.162

Atmospheric Testing

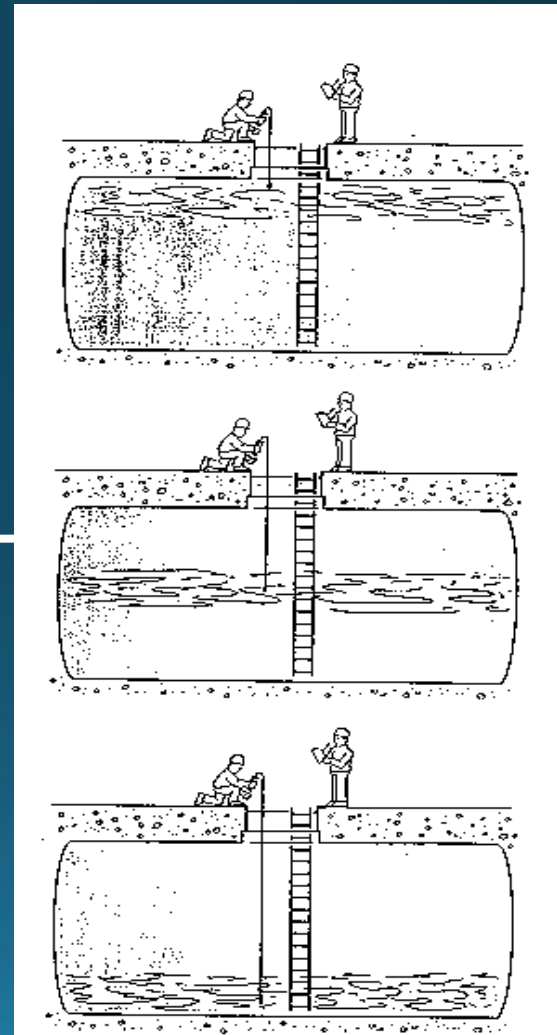
Different gases can be found at different levels

Methane:	0.55
Ammonia:	0.59
Carbon Monoxide:	0.96
Nitrogen:	0.97
Air:	1.0
Hydrogen Sulfide:	1.2
Carbon Dioxide:	1.5
Gasoline:	3- 4
Jet Fuel, JP-8:	4-7

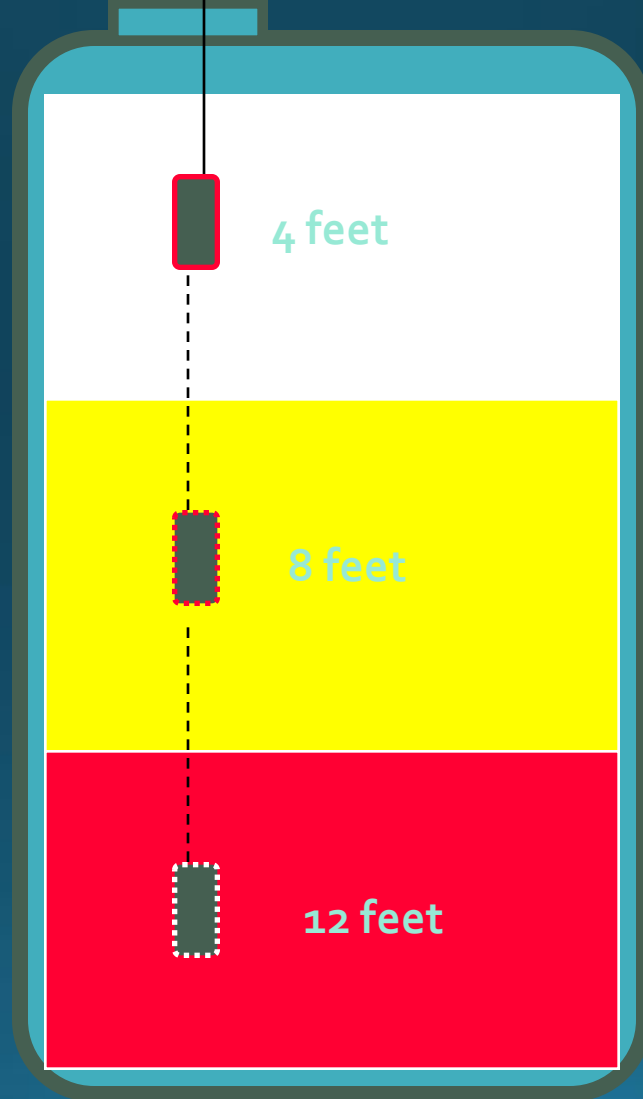
*Lighter than
air gases*



*Heavier than
air gases*



Test at 4' Intervals



Good Air

Poor Air

Deadly Air

Good air near the opening does NOT mean there is good air at the bottom!

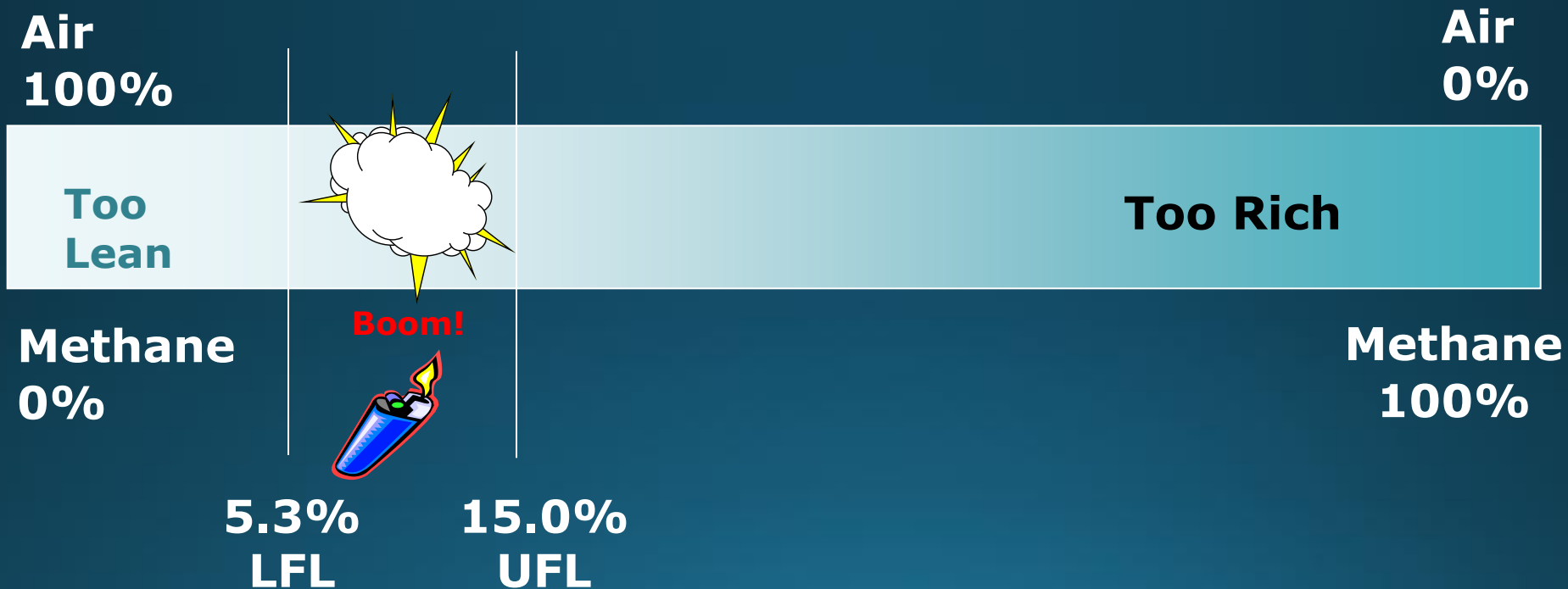
Flammable Gas, Vapor or Mist

- In excess 10% of the LEL (LFL)
 - Considered hazardous
 - Typically toxic
 - Entry forbidden
- If concentrations above the LEL (LFL)
 - Ignition from spark or flame



Flammable Gas, Vapor or Mist

Example of flammable gas levels - Methane



An open flame or a spark will cause an explosion when methane amount is between 5.3% and 15%, the upper flammable limit (UFL).

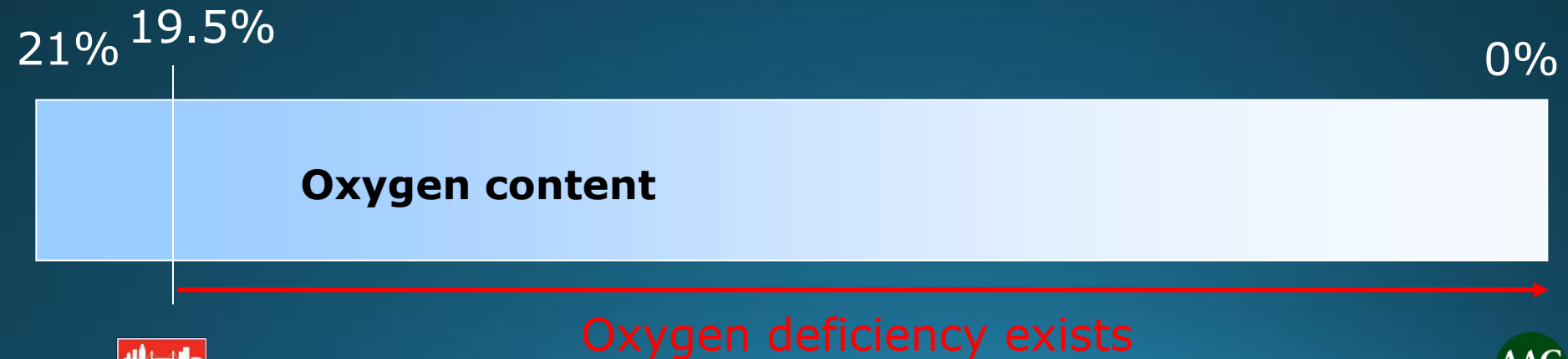
Flammable Limits

- **WARNING**
- If a confined space is
 - Above the upper flammable limit
 - And then ventilated or opened to an air source
 - The vapor will be diluted
 - The concentration can drop into the flammable limit range



Oxygen Deficiency

- Possible causes:
 - Rusting
 - Microbial activity
 - Replacement by another gas
 - Combustion
- Less than 19.5%
- Serious health hazard
 - Possible death



Effects of Oxygen Deficiency

<u>% Oxygen</u>	<u>Symptoms</u>
19.5% - 16%	Fatigue, mild impaired coordination
16% - 12%	Increased breathing rate and pulse; impaired coordination, perception or judgment
12% - 10%	Further increased breathing rate, blue lips, mental confusion
10% - 8%	Fainting, nausea, vomiting, mental confusion within few minutes
8% - 6%	Collapse, death within 8 minutes
6% - 0%	Coma within 40 seconds, death

Using an "inerting gas" like nitrogen, to counteract flammable vapors will result in an oxygen deficiency.

Oxygen Enriched

- More than 23.5%
- Fire and Explosion hazard
- Never
 - Use oxygen to ventilate
 - Store or place compressed tanks in confined spaces



Hydrogen Sulfide

- Odor Threshold
 - .3 PPM
- 10 PPM TWA & REL
- 15 PPM STEL
- 20 PPM Ceiling
- ACGIH
 - 1 PPM TWA
 - 5 PPM STEL
- Olfactory fatigue
 - the loss of ability to smell the substance
 - H₂S causes paralysis of the olfactory nerves



Hydrogen Sulfide

- Commonly found in sewers
- It can be instantly fatal at higher levels in a confined space
- Disturbing sewage sludge can release more hydrogen sulfide gas.



Carbon Monoxide

- Odorless
- Colorless
- Combustion By-product



	<u>PPM</u>	<u>Effect</u>	<u>Time</u>
REL 35 PPM	50	Permissible Exposure Level	8 Hours
	200	Slight headache, discomfort	3 Hours
	600	Headache, discomfort	1 Hour
	1000-2000	Confusion, nausea, headache	2 Hours
	1000-2000	Tendency to stagger	1 1/2 Hours
	1000-2000	Slight heart palpitation	30 Min.
	2000-2500	Unconsciousness	30 Min

Carbon Monoxide

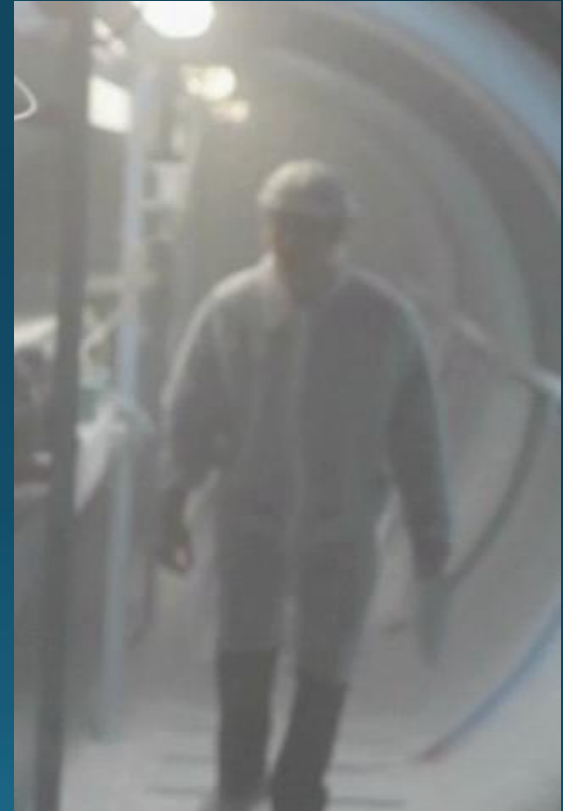
- Possible cause:
 - Operating internal combustion engines in or near confined space
 - Propane-powered engines
- Fatal levels of CO are quickly reached in confined spaces



**Propane-powered
manlift in a large tank**

Combustible Dust

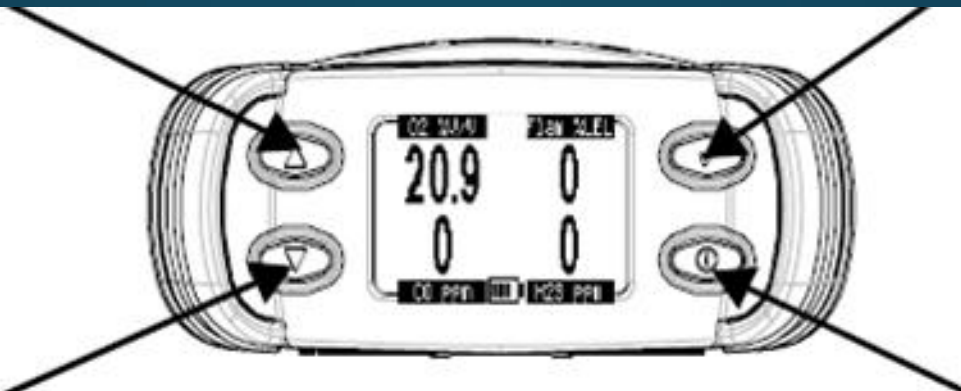
- Concentration meets or exceeds LFL
- Note: This concentration may be approximated
 - A condition in which the combustible dust obscures vision
 - At a distance of 5 feet (1.52 meters) or less.



Monitoring Equipment

- Set up
- Calibration
- Charging
- Training





4.1 Monitoring Condition

1 % = 10,000 PPM

4.1.1 Display Screens

With no alarm conditions the display will typically show:

O2	%V/V	FLM	%LEL
20.9		0	0
0		0	0
CO	ppm	H2S	ppm

The gas sensors and their respective units are displayed, complete with a battery gauge monitor at the bottom. For an instrument fitted with less than four sensors each unused sensor position will show '---'.

Several data screens are available and these can be viewed by pressing the ▲ and ▼ buttons to cycle through. The symbol in the center of the screen will identify which screen is active.

Calibration

- Full calibration
 - Per manufacturer
- Calibration check (bump test)
 - Per manufacturer
 - Prior to each use v. a known concentration



Calibration in Five Easy Steps with Enforcer

- 1
 - Screw the multi gas cylinder into Enforcer
 - Check the pressure gauge to ensure the cylinder is not empty
- 2
 - Open the Enforcer by pulling the sliding tray forward
 - The tray 'locks' open when lowered in its tracks



- 3
 - Turn on and insert the Impact to be calibrated. The instrument may be zeroed in fresh air first if required
 - Ensure that the instrument is locked into position on the guides located on the sliding tray



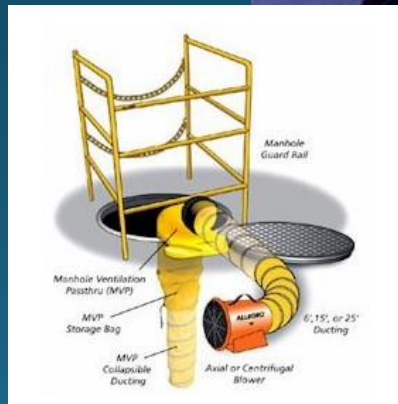
- 4
 - Close the sliding tray by lifting the handle
 - When closed Impact will automatically recognise



- 5
 - Press the button to calibrate the Impact
 - Calibration can take between 45 and 90 seconds subject to the age of the instrument
 - Upon completion Impact will display the results of the calibration
 - Results may be downloaded via the PC software and printed for report purposes if required

Ventilation

- Blowers or fans
- Adequate size for space
- Ensure intake is pulling “clean” air
- Caution
 - Pockets of un-ventilated air



Ventilation



Ventilation

- Exhaust ventilation
 - Welding/torching
 - Using chemicals



Non-entry Rescue

- Required, unless:
 - Increase risk
 - Not help with rescue
- Retrieval systems
 - Harness, retrieval line
 - Vertical 5 ft or deeper
- Confirm emergency assistance-in case of failure



Equipment

- Testing & monitoring
- Ventilation
- Communication
- PPE
- Safe and adequate lighting
- Barriers, shields
- Ladders (ingress/egress equip)
- Rescue and emergency equipment
- Anything else required



Training

- Understandable
- Prior to assignment
- Prior to change in duties
- Change in entry operations
- Observed deviation in procedures
- Knowledge deficit
- Establish proficiency
- Record-for employment



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